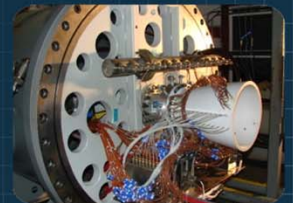




NATIONAL INSTITUTE FOR ROCKET PROPULSION SYSTEMS

**The National Institute for Rocket  
Propulsion Systems (NIRPS) and the  
management and preservation of the  
Supply Chain and Rocket Propulsion  
Industrial Base**

**Rajiv Doreswamy, Ph.D.  
NIRPS Implementation Manager  
NASA/Marshall Space Flight Center**

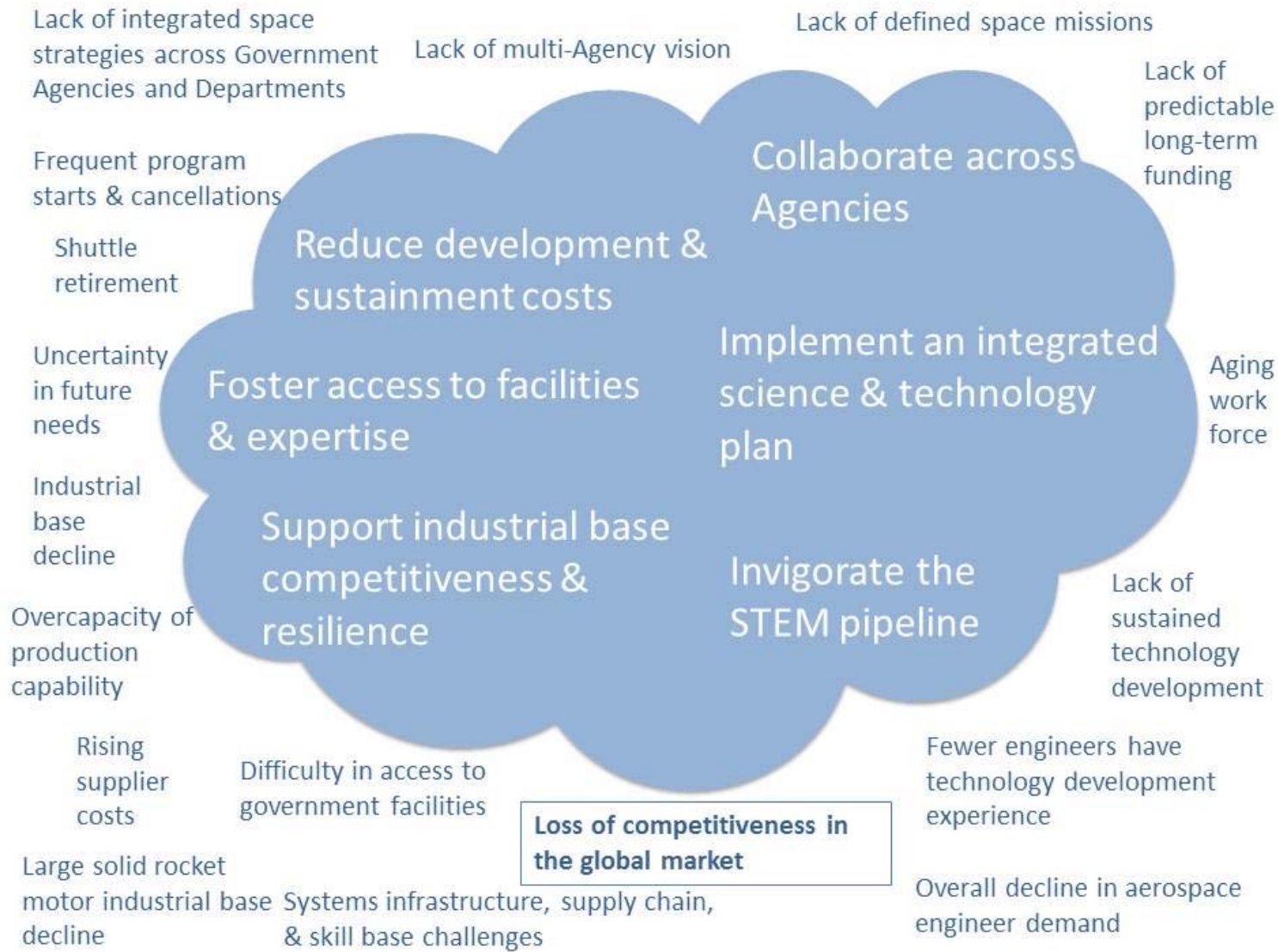


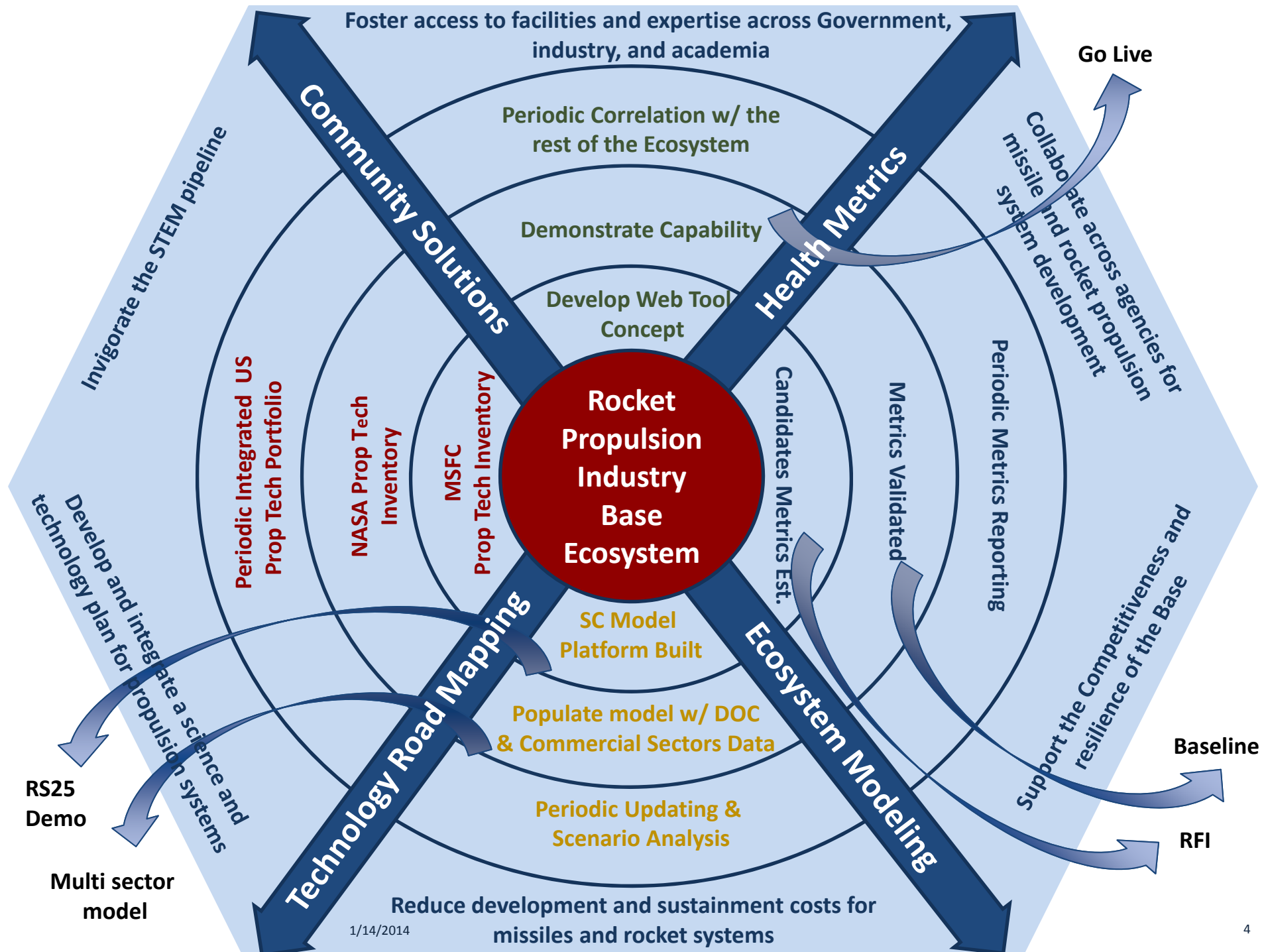
# NIRPS: Where we started

- Widespread recognition of the problem
- September 16, 2011 NIRPS authorization letter signed by NASA Administrator Bolden
- Established MSFC as NASA lead, in cooperation with USAF, NRO



# Derivation of the Grand Challenges

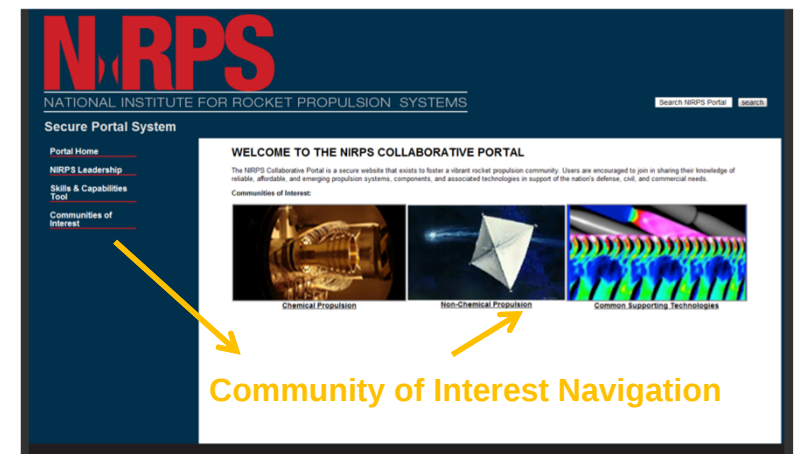






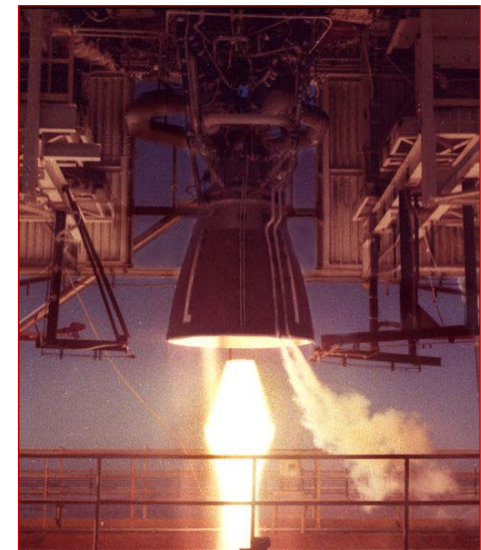
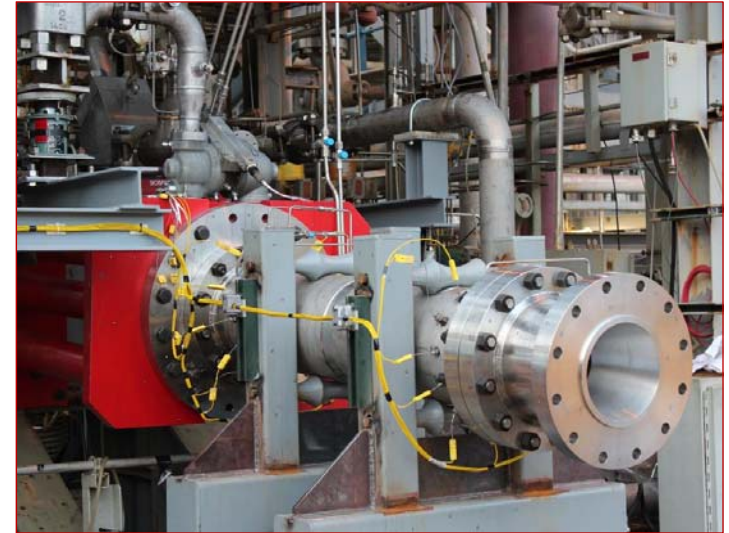
# Foster Access Across IB

- Objective: Develop an interactive web-based collaborative tool for use across the propulsion community
- Developed key “solutions strategies”
- Contracted tasks with CPIAC to continue additional development of NIRPS Web Capability
- Initiated task with Defense Acquisition University to perform streamlined facilitation mechanisms study
- Upcoming Schedule - NIRPS Skills & Capabilities Directory/Web Portal
  - July 2013 Skill & Capabilities Directory “Goes Live”
  - Oct-Nov 2013 Implement Small Team Collaboration Sites
  - Jan 2014 Implement Communities of Interest Sites
  - Feb 2014 Release Fully Functional Web Portal Tool



# Develop Integrated S&T Plan

- Objective: Integrate NASA Propulsion Technology Efforts with similar USG Products and Roadmaps, i.e. AFRL Integrated High Payoff Rocket Propulsion Technology (IHPRPT/RP21)
- IHPRPT/RP21 efforts focus on long-term view of technology development resulting in propulsion technology that can be used by the USG and RPIB
- NASA efforts tend to be more product-oriented focused on near-term technology solutions of specific problems
- Integration of Government S & T portfolios is underway
- Continue discussions for synergistic collaborations across government agencies



# Collaborate Across Agencies

- Objective: Facilitate the development of a near-term plan to enable a more stable demand and better predictability of pricing for Ammonium Perchlorate (AP)
- AP used by every armed service and many commercial firms
- Historical decline in demand for ammonium perchlorate, increasing costs and threatening remaining domestic supplier
- NIRPS facilitated coordination between government users in early 2012, stabilizing demand, production, and pricing



NIRPS AP Team presented Technical Achievement Award from the Air, Space and Missile Defense Association Jan. 25, 2013



# Reduce Development, Sustainment Costs

- Objective: Leverage Multiple “Advanced Manufacturing” efforts applied to propulsion elements
- One-Piece SLM Injector Design, Fabrication, & Hot-Fire Testing Performed In-house at NASA-MSFC
- Traditional injector : 4 parts, 5 welds, 6 months
- SLM injector: 1 piece, 3 weeks printer to test stand
- Post-test inspections indicated that the injectors remained in excellent condition





# Invigorate STEM Pipeline

## Academic Workshop

- Objective: to provide a forum to solicit input from the academic community on NIRPS
- Location: UA Huntsville
- Date: December 16-17
- Membership: UA Huntsville will coordinate membership. Dr. Bob Fredrick and Dr. Tom Koshut will lead effort



# Support Competitiveness of Industrial Base

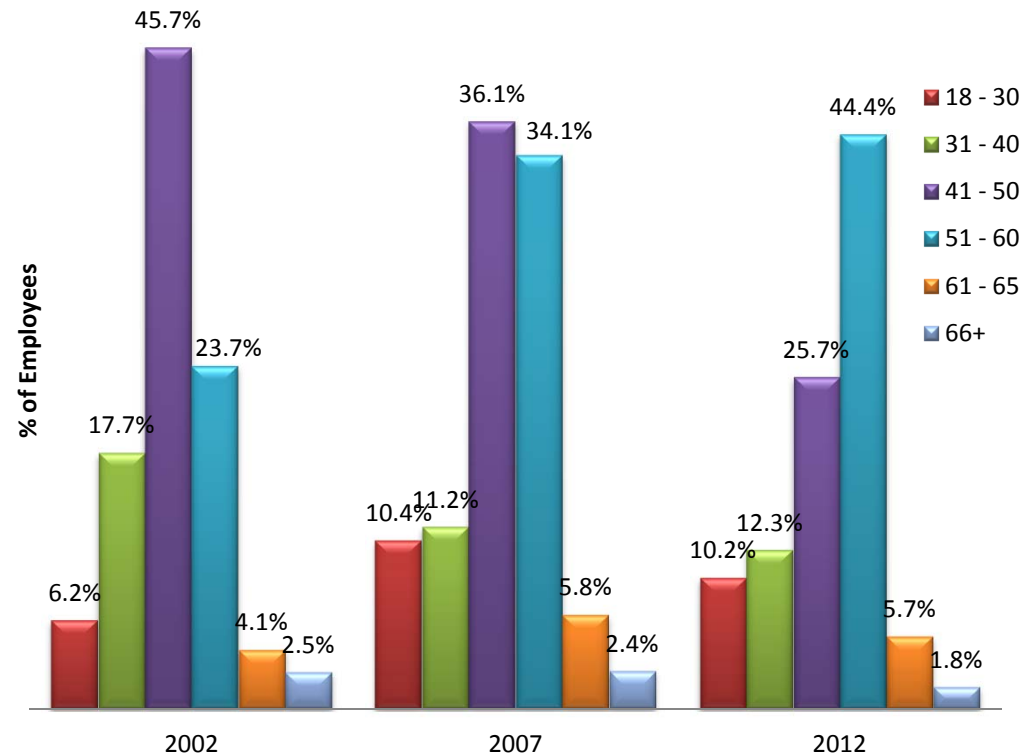
## Industrial Base Health Metrics

- Objective: Develop useful metrics that can serve as indicators of the overall health of the Propulsion Industrial Base
- Developed survey to collect data for Industrial Base Health Metrics
- Input from a variety of organizations
- Analyzed data was published as an AIAA Space 2013 paper

*Rajiv Doreswamy and Emma K Fry:  
2013 U.S. Propulsion Industrial Base  
Health Metrics Survey Preliminary  
Results*

- Validate by comparing with Department of Commerce data for validation

RPS Age Demographics



# Support Competitiveness of Industrial Base

## SLS Supply Chain Analysis

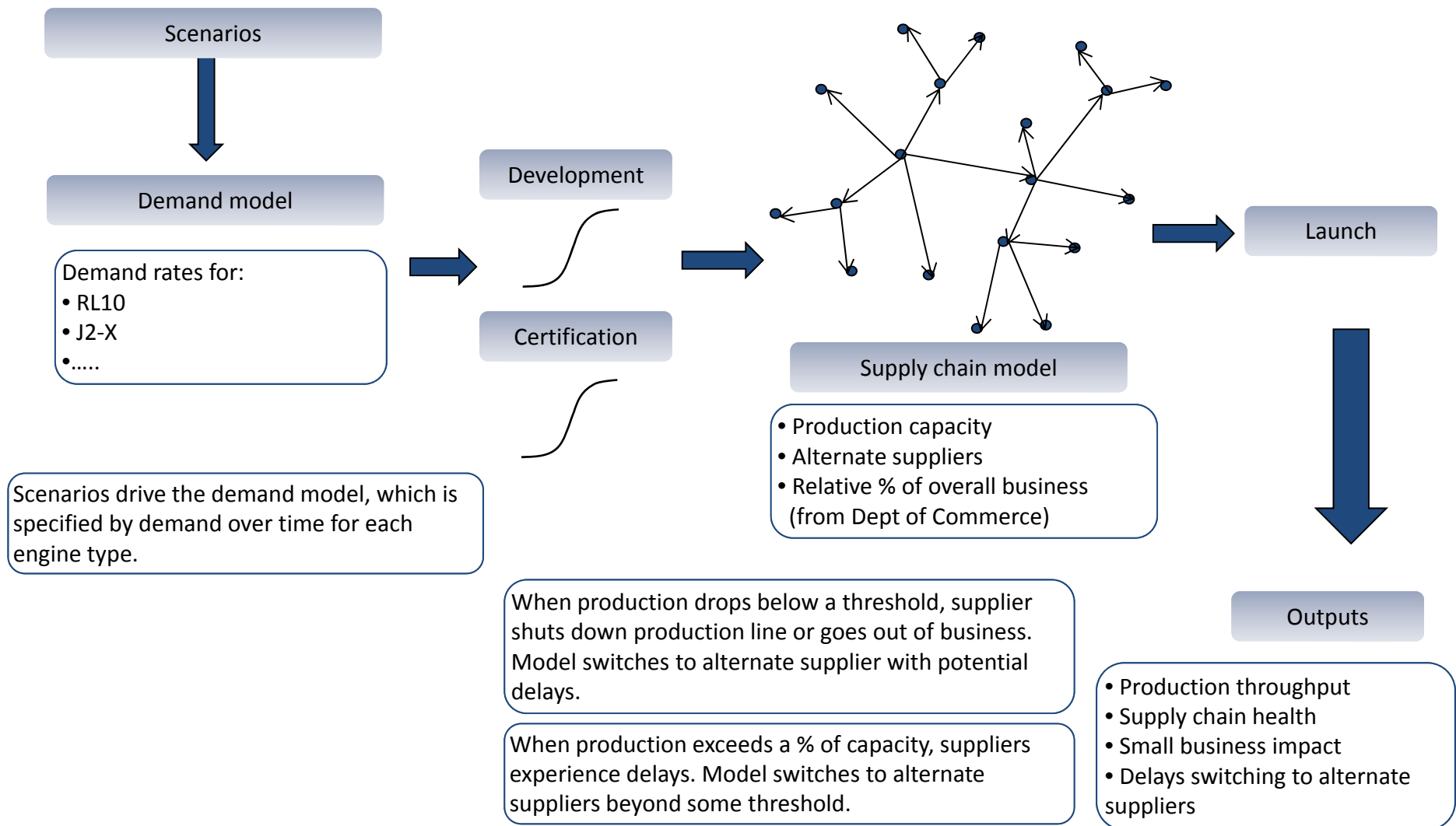
- Objective: Inform Agency Decision makers of the impacts to the Propulsion Industrial Base, due to potential SLS architecture decisions
- NIRPS and Aerospace Corporation to execute in conjunction with HEOMD, SLS Program Office
- Primary Phases focus on Exploration Upper Stage Liquid Engine Options
- Additional Phases will study liquids/solids and tactical/strategic applications





# Support Competitiveness of Industrial Base

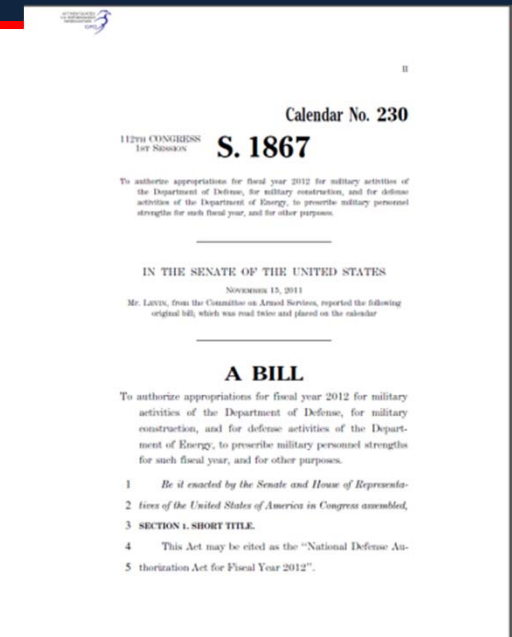
## Propulsion Industrial Base Modeling Approach



# National Defense Authorization Act, Section 1095 Action

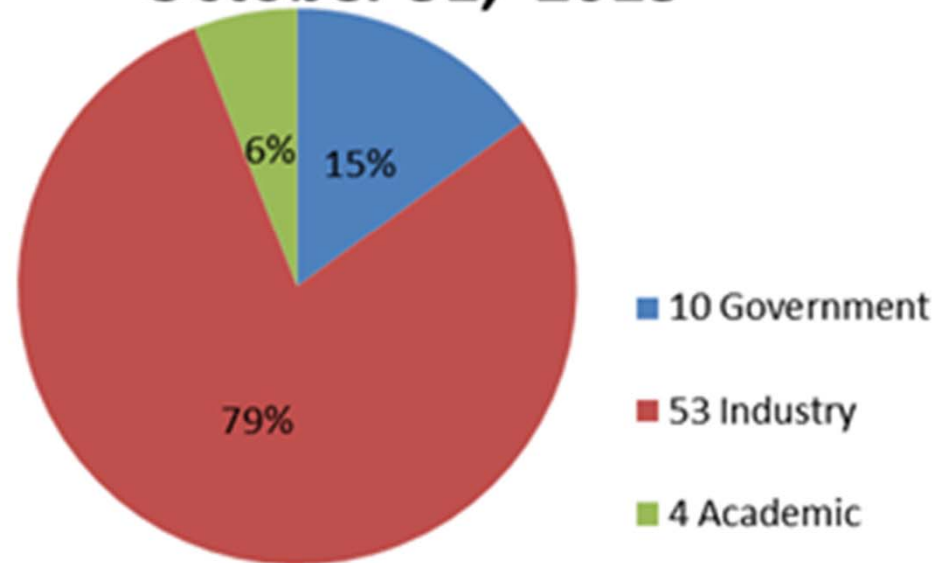
## NDAA Sec. 1095

- *Sustainment of rocket propulsion base is “a national challenge”*
- *Requires President provide a national rocket propulsion strategy including:*
  - *Effect on industrial base of Space Shuttle closeout and Constellation termination*
  - *Administration plans to mitigate impacts to industrial base*
  - *Consolidated plan w/ key decision points for current and next-generation requirements*
  - *Options/recommendations for synchronizing plans, programs, budgets for R&D, procurement, operations and workforce among federal agencies to strengthen industrial base*
- **Interagency Task Team formed w/ equity holders from USG including NASA, DoD, NRO, and FAA**
- **Senior Steering Group (SSG) has held seven meetings with Inter Agency Task Team to provide guidance to the team**
- **Delivery of final report to OSTP completed January 2013**
- **OSTP developed draft National Rocket Propulsion Strategy in May 2013 – in review and coordination cycle with Agencies**



# Growing Participation

## NIRPS Organizations by Sector October 31, 2013



207 Individuals Representing  
67 Organizations

# NIRPS: Positive Value and Lasting Impact

- **NIRPS is adding positive value to the Propulsion Ecosystem**
  - Enabling Collaboration across the US Government
  - Engaging with Industry and Academia
- **NIRPS is “resource light” but “results heavy”**
  - Small Core Staff, augmented by in-kind contributions of the NIRPS community
- **NIRPS has been reviewed and endorsed by senior leaders with equities in propulsion**
  - **NASA Red Team review: October 2012**
    - Endorsed NASA’s strategies, actions and resources in formulation of NIRPS
  - **Industry workshop: December 2012**
    - Endorsed “Grand Challenges” and Initial Concepts
  - **NIRPS Intergovernmental Review with senior government leaders: September 2013**
    - Strategic Plan for Enhancing coordination and cooperation across the USG in Rocket Propulsion Activities
- **NIRPS is Executing tasks of National Importance**
  - NDAA Section 1095
  - Ammonium Perchlorate USG collaboration
  - Developing and validating Propulsion Industrial Base Health Metrics with future collaboration with DOC
  - Rocket Engine Supply Chain Modeling and Analysis





# NIRPS

National Institute for  
Rocket Propulsion Systems

<http://nirps.msfc.nasa.gov/home>